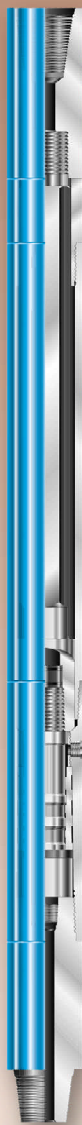


SURFACE BUMPER JAR

Instruction Manual 4300



Surface Bumper Jar

One Company Unlimited Solutions

NOV **NATIONAL OILWELL VARCO**

Surface Bumper Jar

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The designs and specifications for the tools described in this instruction manual were in effect at the time this manual was approved for printing. National Oilwell Varco, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change designs and specifications without notice or without incurring obligation.

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General Description

The **Bowen Surface Bumper Jar** is especially designed and engineered to be installed in the drilling string at the surface. Its presence permits the operator to deliver sharp descending impacts or (downward) jarring blows against the fish at its stuck-point. By a simple adjustment, the Bowen Surface Bumper Jar may be set to deliver very light blows of very high impact.

Use

The Bowen Surface Bumper Jar may be used to great advantage in any situation where the downhole running string (drilling, fishing or washover) becomes stuck, and a heavy downward blow is required to release it. The Bowen Surface Bumper Jar is often used to free key seated drill pipe and drill collars.

It is also used to initiate abrupt jarring blows down the string to actuate Drilling Bumper Subs, Bumper Safety Joints and other similar downhole bumping tools.

The Bowen Surface Bumper Jar is particularly useful for transmitting very heavy downward blows to effect the release of grappling tools such as Overshots or Spears, in situations where the grapples or slips have become imbedded in the fish, or become fouled due to repeated and prolonged downhole jarring.

In many instances, the Bowen Surface Bumper Jar has been successfully utilized, where all previous methods failed.

Construction

Basically, the Bowen Surface Bumper Jar is composed of a Mandrel Assembly which works in conjunction with a Bowl Assembly.

The Mandrel Assembly is composed of a Top Sub, Mandrel and Friction Mandrel.

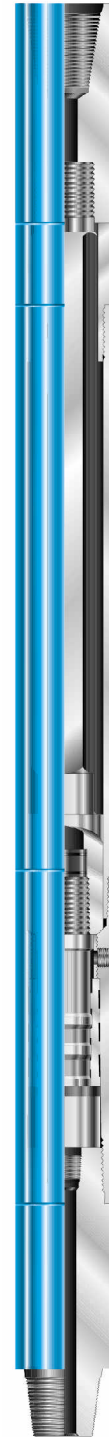
The Bowl Assembly consists of a Bowl, Bowl Extension, Bottom Sub, Knocker Sub, Friction Slip Spacer, Control Ring, Control Ring Plug, Seal Insert and Washpipe.

The Washpipe, which is connected to the Bottom Sub and moves inside of the Main Mandrel, is sealed from the Main Mandrel by the Seal Insert confining the well fluids within the Washpipe and out of the restraining mechanism within the Bowl.

The Main Mandrel, which is hexagon in shape, fits into a correspondingly shaped bore in the Knocker Sub, where it is continuously capable of transmitting torque, while also free to move up and down over its entire 48" stroke.

Control of the Bowen Surface Bumper Jar is exercised by the action of the restraining mechanism of the Friction Mandrel, the Friction Slip, the Friction Slip Spacer and the Control Ring. The Tonnage (the striking force of the jar) is adjusted by setting the Control Ring.

Top and Bottom Subs are furnished with a 5-1/2" F.H. connection. The Top Sub is a box connection and the Bottom Sub is a pin connection. A lifting sub is provided for the top connection for the purpose of transporting and/or lifting the Surface Jar.



Bowen Surface Bumper Jar

Explanation of Mechanism

Referring to the illustration on page 5, it can be seen that the Friction Slip is restricted within the tapered bowl by the Control Ring. Turning the Control Ring to the right or to the left moves the Friction Slip up or down the taper, thereby either increasing or decreasing its ability to expand. There are internal Rings (raised areas) within the Friction Slip which must pass over the external Rings (raised areas) of the Friction Mandrel in order to pull the Jar into its open position and to produce the jarring blow.

When the Surface Bumper Jar is being opened or tripped, the Friction Mandrel pulls the Friction Slip into a reduced section of the taper in the Bowl and against the bottom of the Control Ring. Hence, depending upon the position of the Control Ring, only a slight pull or a pull of many tons is required to open the jar.

When the Surface Bumper Jar is installed at the surface and a straight upward pull is exerted against it, the Friction Slip frictions upon the enclosed friction Mandrel and arrests upward movement while the drill pipe is being stretched. When the upward pull reaches the pre-set tripping tonnage, the Friction Mandrel is pulled through the Friction Slip. The resultant downward surge of the drill pipe in returning to its normal length causes a sudden separation of the Main Mandrel and Bowl assemblies which are free to move apart for the length of its 48-inch stroke and drive the weight of the free pipe against the point where the fish is stuck.

When the Surface Bumper Jar is being closed, the Friction Mandrel pushes the Friction Slip into the enlarged section of the taper in the Bowl and then slides easily through it.

The Control Ring Plug has a projection on its inner end which engages a slot in the Control Ring and prevents it from turning. Removing the Control Ring Plug from the Bowl exposes a port through which the Control Ring may be turned with a Control Ring wrench.

Turning the Control Ring to the right moves it upwardly, in turn, moving the Friction Slip into the smaller diameter of the tapered bowl, therefore constricting the rings more and requiring more tons to open the jar. The words "More Tons" are stamped on the right side of the Control Ring Port.

Turning the Control Ring to the left moves it downwardly, in turn, moving the Friction Slip into the larger diameter of the tapered bowl, therefore expanding the rings more and requiring less tons to open the jar. The words "Less Tons" are stamped on the left side of the Control Ring Port.

NOTE: The Surface Bumper Jar should be pulled open at the rig site before it is brought from the field to be serviced.

Operation

In all types of jarring operations, the Bowen Surface Bumper Jar is installed in the drilling string or fishing string just above the rotary table, or at the joint nearest the table. If circulation is desired, connect the kelly to the top the jar. If circulation is not required, connect a single joint of pipe above the jar. Sufficient weight (300 to 400 lbs.) should be run above the jar to close and re-set it.

Always begin jarring operation with a LIGHT tonnage, gradually increasing the tonnage as the operation proceeds. Set the restraining mechanism to light tonnage by adjusting the Control Ring as indicated by the stencil on the Bowl at the Control Ring Plug.

To adjust the Control Ring, remove the Control Ring Plug and then, using the Control Wrench, rotate the Control Ring to the RIGHT to increase the tripping tonnage or to the LEFT to decrease the tripping tonnage.

Take an upward strain on the Bowen Surface Bumper Jar. When the upward strain is equal to the previously set tonnage, the restraining mechanism will release and allow the Bowl Assembly to descend rapidly with respect to the Mandrel Assembly for 48 inches. This will cause the weight of the stretched pipe to fall downward against the stuck fish.

To Free a Stuck Drill String

Drill Strings frequently stick on the trip out of the hole by pulling into a keyseat. Install the Bowen Surface Bumper Jar in the drill string as explained above. Set the Jar for light tonnage and begin jarring operations, gradually increasing the tonnage as jarring proceeds, until the drill pipe is free.

CAUTION: Do not set the tripping tonnage of the Jar higher than the weight between the surface and the point where it is stuck. If the tripping tonnage is set higher than the weight of the amount of free pipe above the stuck point, it will result in the pipe being pulled tighter into the keyseat.

Do not use a load setting that will create a stretch in the drill string that is greater than the stroke of the jar. This could cause an impact within the jar and possibly damage the hook or other rig components.

Be aware that a sudden freeing of a heavy fish will allow the fish to drop and strike a jarring blow with the jar. This could also damage the rig.

A similar procedure is observed in all cases of stuck pipe.

To Actuate a Bumper Sub

Many drilling operators employ Drilling Bumper Subs in the drilling string. Also, almost all fishing operators install a Bumper Sub above engaging tool in a fishing string. When the String, in either case, becomes stuck and the Bumper Sub is ineffective, install a Bowen Surface Bumper Jar in the string as explained above.

Set the Surface Bumper Jar for light tonnage, just enough to open the Bumper Sub. Thereafter, gradually increase tonnage but observe the precaution cited above and do not set the tripping tonnage so high that it exceeds the weight of the free pipe above the stuck point. Continue jarring with the Surface Bumper Jar until the stuck string is free.

To Release a Fishing Tool

Occasionally, fishing tools or grappling tools such as Overshots or Speaks cannot be released by the normal procedure of bumping down with the weight of the fishing string. This is usually the result of the Grapple or the Slips having become imbedded in the fish or having become fouled due to repeated and prolonged bumping and jarring on the fish.

In such cases, install a Bowen Surface Bumper Jar in the fishing string as explained above. Set the tonnage at a medium tonnage but do not exceed the weight of the free pipe below the Surface Bumper Jar. If there is a Bumper Sub in the string, set the tonnage high enough to insure that the Bumper Sub is pulled into its fully open position. Open the Surface Bumper Jar to effect the release of the Grappling tool. This will usually require only one or two blows.

Precautions

Always begin Surface Bumper Jar operations with the Jar set for LIGHT jarring, gradually increasing tonnage as jarring operations proceed.

Avoid setting the tonnage of the Surface Bumper Jar to exceed the weight of the free pipe between the Jar and the stuck point. This will usually result in defeating the purpose of the Jar and may stick the pipe tighter.

Occasionally, the Bowen Surface Bumper Jar may become “half-cocked” — where the Jar is neither fully opened nor fully closed. This situation results from having set the tripping tonnage so high that there is insufficient pulling power to trip the Jar and the weight of the pipe above the Jar is insufficient to close it.

It is then necessary to break the Jar out of the string, protect the pin connection thread on the bottom, and strike the Jar sharply against some solid object until the Jar is closed. Then, the Control Ring may be adjusted for less tripping tonnage and the operation resumed.

NOTE: It is important that the Surface Bumper Jar be opened at the rig site before it is brought in from the field for servicing.

Maintenance

The Bowen Surface Bumper Jar normally requires very little maintenance. After each use, it should be thoroughly rinsed out with clear water to remove any drilling fluid that may have been circulated through it. The Jar should be opened so that the surface of the hexagon Main Mandrel may be lubricated with a good grade of heavy weight oil or grease. After lubricating the Main Mandrel, the Jar should be set to minimum tonnage and then closed. The exterior surface may be painted or lubricated to prevent any rust or deterioration.

Disassembly

Complete disassembly of the Bowen Surface Bumper Jar should proceed as follows:

1. Secure the tool in a suitable vise, clamping it at the Bowl. Do not clamp on the Control Ring Plug.
2. Loosen the Bottom Sub in the Bowl. Remove the Bottom Sub and Washpipe as a unit and lay them aside. Since the Washpipe is tightened into the Bottom Sub, they will remain attached.
3. Remove the Friction Slip spacer from the lower end of the Bowl.
4. Remove the Control Ring Plug and rotate the Control Ring to minimum tonnage position as far as it will go, if this has not previously been done.
5. Slide the Mandrel out far enough to partially open the Jar, releasing the Friction Mandrel from the Friction Slip.
6. Remove the Friction Slip from the inside of the Bowl.
7. Re-clamp the tool, clamping on the Bowl Extension.
8. Break loose and remove the Friction Mandrel from the Main Mandrel. Use the wrench Flats provided on the lower end of the Friction Mandrel to remove it. **DO NOT APPLY A WRENCH TO THE FINISHED SLIP SURFACE!**
9. Remove the Packing Set from the inside, lower end of the Main Mandrel. A screwdriver with a bent end will aid the operator to reach through the bore of the Packing Set and pull it out.
10. Break out and remove the Top Sub.

11. Slide the Mandrel down through the Knocker Sub and Bowl Extension to remove it. Lay it aside.
12. Thoroughly clean and examine all the parts. Replace any damaged or badly worn parts that are found. Examine the Seals or Packing for evidence of damage or too much "permanent set." If they are not in good condition, replace them.

In particular, examine the Washpipe for nicks, scratches or abrasions. Small, superficial scratches and abrasions may be polished out by use of crocus cloth. If the Washpipe includes any severe gouges or scratches, it must be replaced.

To replace the Washpipe, clamp the Bottom Sub in a vise horizontally, supporting the Washpipe end farthest from the Bottom Sub, with a wood timber or other support. Unscrew and remove the damaged Washpipe. Assemble the new Washpipe into the Bottom Sub, taking care to support the free end, to avoid bending the Washpipe.

Clean, good quality thread dope should be applied to each connection as it is made up. All parts should be lubricated with good quality grease or heavyweight oil as they are assembled.

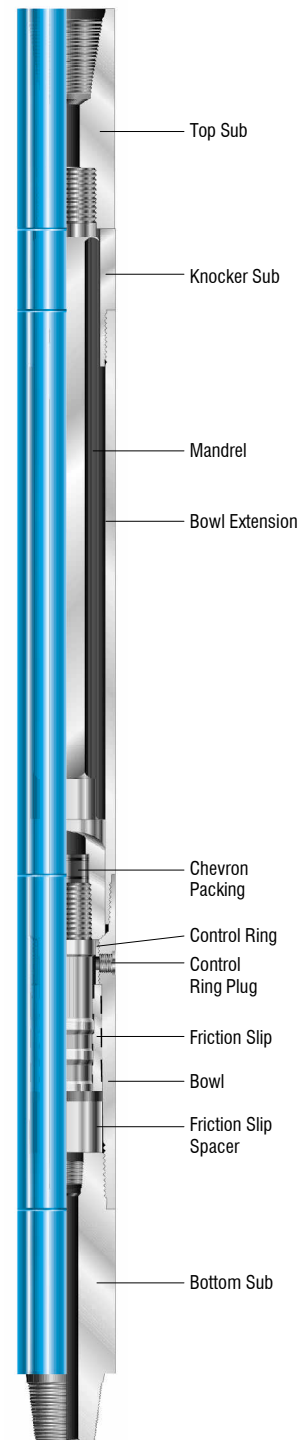
Assembly

Before assembling the Bowen Surface Bumper Jar, make sure that all of the parts are thoroughly cleaned, lubricated and in good condition. Replace all damaged or badly worn parts.

1. Install the Packing Set into the Seal Insert.
2. Install the two O-Ring Seals on the O.D. of the Seal Insert in the grooves provided. Set the Seal Insert aside for later use.

NOTE: In the following operations, make sure that thread dope is thoroughly applied to all threads before making them up.

3. Clamp the Bottom Sub in a suitable vise.
4. Make the Washpipe up to the Bottom Sub. Support the free end of the Washpipe, and do not wrench on the sealing surface of the Washpipe.
5. Remove the Bottom Sub-Washpipe Sub-Assembly from the vise and lay it aside.
6. Clamp the Bowl Extension in the vise.
7. Assemble the Knocker Sub in the Bowl Extension. Wrench it up tight.
8. Insert the threaded end of the Main Mandrel through the Bowl Extension and Knocker Sub.
9. Make the Top Sub up to the end of the Main Mandrel and tighten it.
10. Lubricate the Packing Set and install it into the recess provided in the lower end of the mandrel, seating it securely against the shoulder. It may be necessary to seat the Insert, by placing a hardwood block against it and striking the block a sharp blow with a hammer.



Bowen Surface Bumper Jar

11. Insert the Friction Mandrel into the Main Mandrel and Wrench it up tight. Wrench only on the wrench flats provided.
12. Install the Control Ring inside the Bowl in the threads provided. In making the setting, the Control Ring is turned back to the lowest point; then, the Slip Setting Gauge is used to achieve the proper low tripping tonnage setting. (The Slip Setting Gauge is a rigid tube of the same outside dimensions and appearance as that of the Friction Slip, except that it does not have the vertical slots cut in it. In addition, a rod is provided which, when screwed into the top edge, serves as a handle for inserting the slip setting gauge into the Bowl of the tool.) The Slip Setting Gauge is placed in the taper of the Bowl and held securely as far into the Bowl as possible. The Control Ring should then be screwed until it moves toward the slip setting gauge and touches the bottom of the slip setting gauge. To screw the Control Ring up until it touches the bottom of the slip setting gauge, the Control Plug should be removed from the Bowl. A screwdriver can be inserted to engage with the adjusting slots in the Control Ring and easily permit screwing the Control Ring toward the Slip Setting Gauge.

13. Insert the Friction Slip inside the Bowl.
14. Insert the Friction Slip Spacer inside the Bowl and up against the Friction Slip.
15. Install the Washpipe-Bottom Sub

Assembly. This piece was assembled in Steps 4 and 5. Grease the Washpipe to cut down Friction on Packing. Insert Washpipe carefully inside the Main Mandrel to avoid damaging the Packing. Make up Bottom Sub to the Bowl.

16. Place assembled Tool in tester and adjust control ring to desired tripping load.
17. Install the Control Ring Plug into the Control Ring port located on the Bowl.

Bowen Surface Bumper Jar Calculated Strength Data

Maximum Torque at Yield	33,800 ft-lbs
Maximum Tensile Load at Yield	845,000 lbs
Maximum Allowable Pump Pressure	8,000 psi
Setting Load * (Tripping Tonnage)	0 to 50 Tons

* 0 to 100 tons with optional 9" O.D. Bowl

The above tensile strengths are calculated theoretical yield strengths and are considered accurate to $\pm 20\%$.

These figures do not constitute a guarantee, actual or implied. They are meant to serve as a guide only. Appropriate allowance must be made in use as a safety factor.

Maximum Recommended Tightening Torque for Threaded Connections

Assembly No.	Tool O.D. X I.D. (in)	Top Sub to Main Mandrel (ft-lbs)	Knocker Sub to Bowl Extension (ft-lbs)	Bowl Extension to Bowl (ft-lbs)	Bowl to Bottom Sub (ft-lbs)	Main Mandrel to Friction Mandrel	Bottom Sub to Washpipe (ft-lbs)
74520	7 x 1-7/8	16,900	16,900	17,900	17,900	2,700	2,700

The above makeup torques are the maximum recommended make up torques for each connection. They are set at 50% of the calculated theoretical yield torque.

Bowen Surface Bumper Jar

		5-1/2	5-1/2
Connection		F.H.	F.H.
O.D.		7	7
I.D.		1-7/8	1-7/8
Stroke		48	48
	Part No.	74520	**14770
Complete Assembly	Weight	1160	1160

OBSOLETE
(FOR REF. ONLY)

Replacement Parts

	Part No.	13587	13587
Top Sub	Weight	265	265
	Part No.	74522	13586
Knocker Sub	Weight	50	50
	Part No.	74523	13585
Bowl Extension	Weight	455	455
	Part No.	74524	13582
Bowl	Weight	220	220
	Part No.	74525	13581
Bottom Sub	Weight	215	215
	Part No.	78609	14771
Main Mandrel	Weight	298	298

How to Order:

Specify:

- (1) Name and Number of Assembly or Part
- (2) Size and Type of Top and Bottom Connection

Sold Export Only

** Old Design with Tapered Part Connections.

† For optional O-ring seal configuration

Replacement Parts (Continued)

	Part No.	13588	13588
Washpipe	Weight	58	58
	Part No.	66816	13694
Packing Set	Weight	4	4
	Part No.	78610	14772
Friction Mandrel	Weight	28	28
	Part No.	844	844
Control Ring	Weight	3	3
	Part No.	B236	B236
Friction Slip	Weight	17	17
	Part No.	13594	13594
Friction Slip	Weight	4	4
Spacer			
Control	Part No.	4144	4144
Ring Plug	Weight	1/4	1/4

Accessories

Friction Mandrel	Part No.	14773	14773
Socket Wrench	Weight	27-1/2	27-1/2
	Part No.	242	242
Lifting Sub	Weight	50	50
	Part No.	86	86
Plug & Control	Weight	1/2	1/2
Ring Wrench			

Extra

Jar Service Kit	Part No.	13693
Thread Lubricant (KOPR-KOTE)	Part No.	153823
Test Sub (Pin)	Part No.	13592
Test Sub (Box)	Part No.	237-2

Optional

Seal Insert †	Part No.	13665
Non-Extrusion Ring †	Part No.	365-37 (2 req'd.)
Seal Protector Ring †	Part No.	375-37 (2 req'd.)
Washpipe Seal †	Part No.	568334
Insert Seal †	Part No.	568235 (2 req'd.)
Seal Insert Removal Tool †	Part No.	59331

Recommended Spares:

- (1) 2 Washpipes
- (2) 1 Seal Insert †
- (3) 1 Friction Mandrel
- (4) 1 Control Ring
- (5) 1 Friction Slip
- (6) 1 Control Ring Plug
- (7) 4 Non-Extrusion Rings †
- (8) 4 Seal Protector Rings †
- (9) 6 Packing Sets

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* Denotes Manufacturing and Engineering facilities

Downhole Solutions

Drilling Solutions

Engineering and Project Management Solutions

Lifting and Handling Solutions

Production Solutions

Supply Chain Solutions

Tubular and Corrosion Control Solutions

Well Service and Completion Solutions